CRiSTAL
food security

CRiSTAL Food Security 2.0 User's Manual

Community-based Risk Screening Tool – Adaptation and Livelihoods

Focus on Food System Resilience

iisd International Institute for Sustainable Development / Institut international du développement durable

Nitlapan

UCA Universidad Centroamericana

UNAH Universidad Nacional Autónoma de Honduras

ACCION CONTRA EL HAMBRE ACF INTERNATIONAL

ISET

© 2014 The International Institute for Sustainable Development
Published by the International Institute for Sustainable Development.

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the International Development Research Centre (IDRC), from the Danish Ministry of Foreign Affairs and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations and the private sector.

This document is an output from a project funded by the U.K. Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of the Climate and Development Knowledge Network, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them.

Climate & Development Knowledge Network

International Institute for Sustainable Development
Head Office: 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Web site: www.iisd.org

PHOTO CREDITS
Cover: iStockphoto
Page 10: Marius Keller, IISD
Back cover: Andrea Rivera Sosa

Contents

Introduction 4

Concepts 5

Goals and Structure 8

Methods and Resources 10

- Community Consultations 10
- Other Sources of Information 11
- Required Resources 11

CRiSTAL Food Security Step-by-Step 13

- Getting Ready 13
- A) Introduction 13
- B) Context 14
  - Community Context 14
  - Climate Context 14
- C) Food System 16
  - Food Utilization and Consumption 16
  - Food Access 16
  - Food Availability 17
  - Supporting Resources and Services 17
  - Supporting Organizations and Policies 18
- D) Resilience Analysis 18
  - Resilience of Food Utilization and Consumption 19
  - Resilience of Food Access 19
  - Resilience of Food Availability 19
  - Resilience of Supporting Resources and Services 19
  - Resilience of Supporting Organizations and Policies 20
- E) Indicator Selection 20
- F) Reports 21

Additional Resources 22

References 23

Introduction

Climate variability and change affect both natural and human systems, altering the productivity, diversity and functions of many ecosystems and livelihoods around the world. Such impacts can affect the food security of vulnerable communities in multiple ways. For example, food production can be directly affected by increasing temperatures, changing rainfall patterns and climate extremes. People's ability to absorb food can be compromised by water-borne diseases—the spread of which may be facilitated by extreme rainfall or drought. Food access may be limited by various climate impacts on people's incomes and on food prices. Climate hazards are also likely to increase the instability of food availability, access and utilization.

Although climate variables may not always be the most important drivers of food insecurity at the local level, they can undoubtedly put the food security of communities at risk. Given the variety of potential direct and indirect impacts, actions to reduce climate risks to food security should not exclusively focus on making food production more resilient. They should also consider possible entry points for resilience actions within the entire food system, and risks to that system, that allow communities to access sufficient, safe and nutritious food. Only such a holistic approach can help identify the most effective and efficient actions to ensure food security in the context of climate shocks and stresses.

However, local decision-makers can easily be overwhelmed by the complexity of food systems and of the potential climate impacts on their key elements and interlinkages. There is thus a need for a tool to systematically assess the risks to the key factors that underpin food security posed by climate variability and change. This will help to develop actions that strengthen the climate resilience of food systems and to identify indicators that measure changes in resilience over time. CRiSTAL Food Security, a specialized version of the Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL), seeks to address this gap.

Box 1: CRiSTAL

The original CRiSTAL tool was developed by a group of four international non-governmental organizations in response to the outcomes of the first phase of the Livelihoods and Climate Change Initiative, which demonstrated how ecosystem management and restoration and/or sustainable livelihoods projects contribute to risk reduction and climate change adaptation. Recognizing this potential, project planners and managers began asking how they could systematically integrate risk reduction and climate change adaptation into their work. CRiSTAL was developed to respond to this need. Launched in 2007, it has since been applied in over 20 countries in Asia, Africa and the Americas by various institutions and development professionals. Between 2010 and 2012 a completely revised version of CRiSTAL was developed based on extensive user experience and feedback. More information is available on www.iisd.org/cristaltool.

Concepts

The CRiSTAL Food Security tool adopts a food systems and resilience approach in order to understand and reduce the risks that climate variability and change pose to community food security. This section illustrates the conceptual framework that gives the tool its analytical foundation and provides definitions for a number of key terms.

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). This definition comprises four dimensions: food availability, access, utilization and stability (Schmidhuber & Tubiello, 2007). Other definitions of food security may be used in specific countries or communities of practice.

Food systems describe the processes, required inputs and generated outputs involved in feeding a population. Understanding food systems is important to understanding how food security can or cannot be achieved, particularly at the local level. The CRiSTAL Food Security analysis is based on a conceptual framework for food systems proposed by Tyler et al. (2013) (see Figure 1). This framework, which has the form of a spinwheel, puts household food security at its core. The analysis starts in the centre by looking at food utilization—that is, the ability of people to consume and benefit from food, which depends on the diversity and nutritional value of food, health and hygiene aspects, as well as the social values and practices that shape food consumption.

From there, one can look at food access strategies, including how households gain access to food through alternative livelihood strategies. Food access options include subsistence production, purchase, barter and food aid. The third ring describes the processes that ensure food availability such as production, processing, distribution, storage and trading. The two outer rings present the resources and services that support food production and the organizations and policies that influence food availability, access and utilization. Food stability is considered a cross-cutting theme that is analyzed in the context of each spinwheel ring.

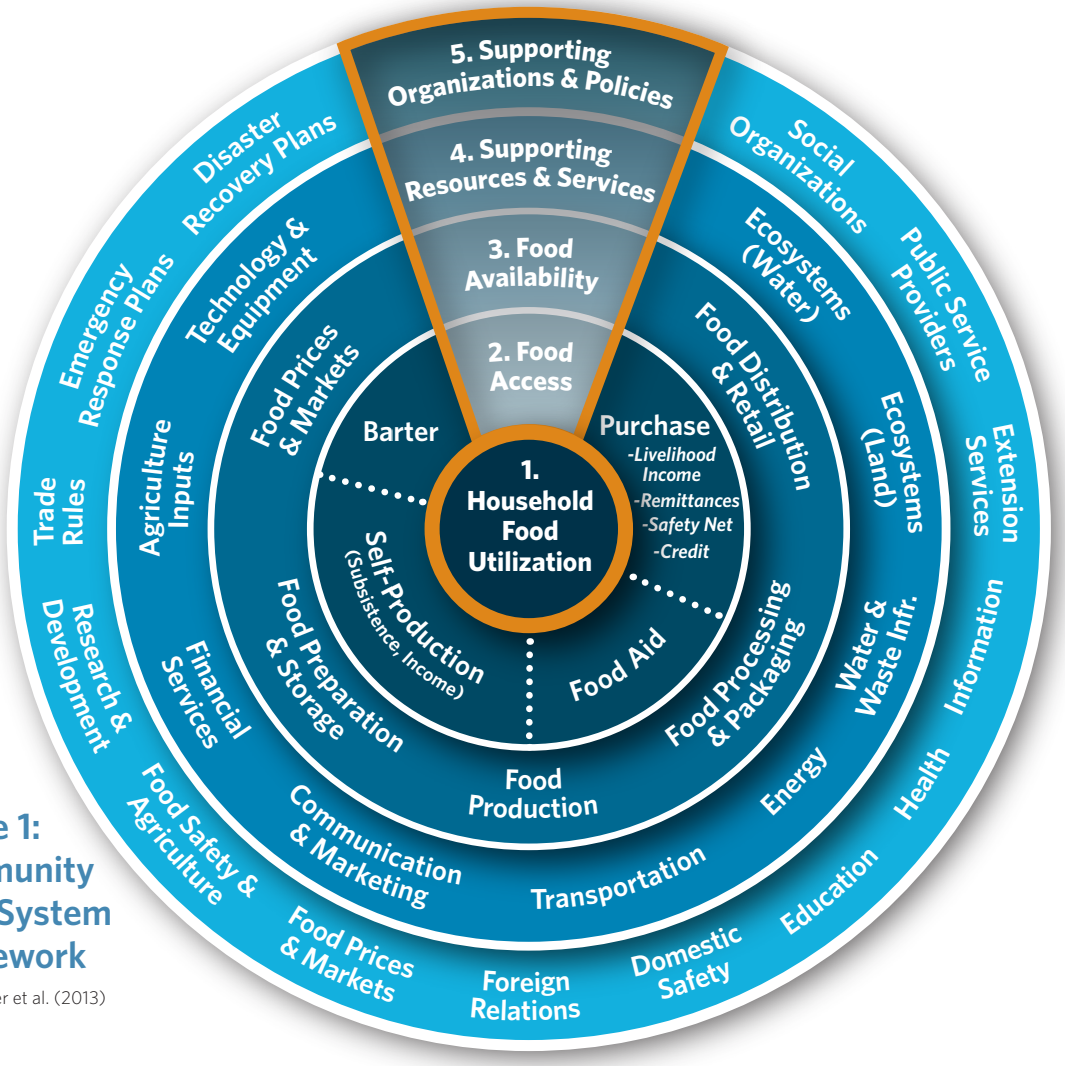

Figure 1: Community Food System Framework

Source: Tyler et al. (2013)

Climate risk is defined as the probability of harmful consequences or expected losses resulting from the interaction of a climate hazard with exposure and vulnerable conditions. Climate hazards include potentially damaging hydro-meteorological events or trends such as storms, floods, droughts or the steady increase of temperatures over several years and decades. Exposure refers to the presence of people and assets in climate hazard-prone areas. **Vulnerability** is defined as susceptibility to harm and is a function of sensitivity (the degree to which people and assets may be affected by climate hazards) and adaptive capacity (the ability of institutions, systems and individuals to take advantage of opportunities or cope with consequences of potential damages) (adapted from Intergovernmental Panel on Climate Change, 2012; Lim & Spanger-Siegfried, 2005; United Nations International Strategy for Disaster Reduction, 2009).

Adaptive capacity is closely related to **resilience**, which can be defined as the ability of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity and feedbacks. The resilience approach is based on the understanding that a system is evolving rather than static, and that the type and magnitude of change is not always predictable, which requires a system to be flexible. It also highlights the intrinsic linkages between ecological and social systems (Nelson, Adger, & Brown, 2007).

In CRiSTAL Food Security, the same five concentric rings shown in the food system framework above are used to analyze resilience. For each ring, specific analytical questions are defined for this purpose (see Figure 2). Those questions are based on resilience criteria developed by Tyler and Moench (2012) (see Table 1). These criteria look at the resilience of systems (with an emphasis on aspects such as flexibility, robustness, diversity and safe failure); agents (focussing on responsiveness, resourcefulness and the capacity to learn) and institutions (rights and entitlements, decision-making processes and access to information). The questions are aimed at identifying a broad range of locally relevant resilience factors without being too prescriptive.

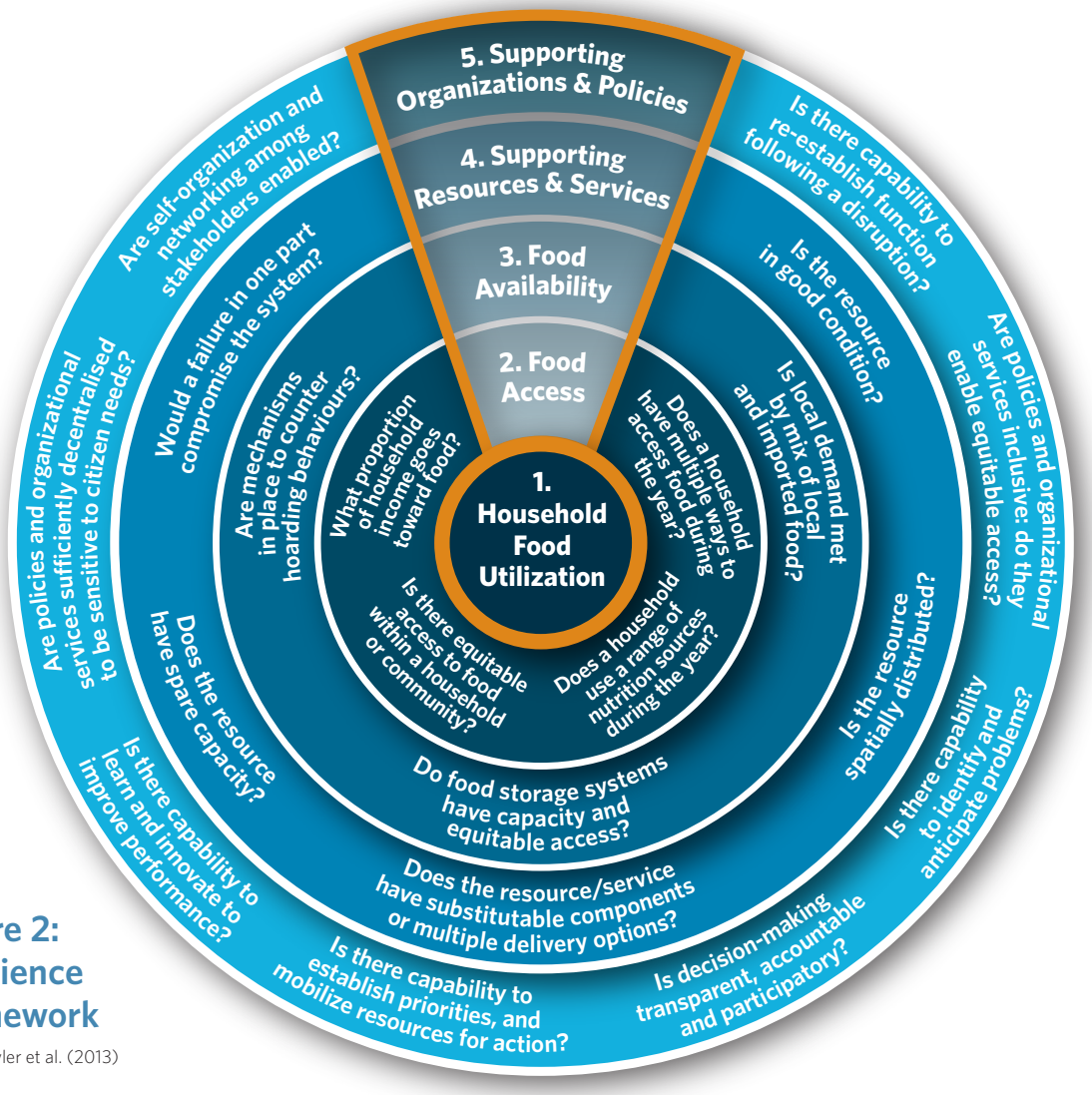
5. Supporting Organizations & Policies
4. Supporting Resources & Services
3. Food Availability
2. Food Access
1. Household Food Utilization
Are self-organization and networking among stakeholders enabled?
Is there capability to re-establish function following a disruption?
Are policies and organizational services inclusive: do they enable equitable access?
Are policies and organizational services sufficiently decentralised to be sensitive to citizen needs?
Is there capability to identify and anticipate problems?
Would a failure in one part compromise the system?
Is the resource in good condition?
Is the resource spatially distributed?
Are mechanisms in place to counter hoarding behaviours?
Is local demand met by mix of local and imported food?
Does the resource have spare capacity?
What proportion of household income goes toward food?
Does a household have multiple ways to access food during the year?
Is there capability to learn and innovate to improve performance?
Is there equitable access to food within a household or community?
Does a household use a range of nutrition sources during the year?
Do food storage systems have capacity and equitable access?
Does the resource/service have substitutable components or multiple delivery options?
Is there capability to establish priorities, and mobilize resources for action?
Is decision-making transparent, accountable and participatory?

Figure 2: Resilience Framework

Source: Tyler et al. (2013)

Table 1: Normative criteria for resilience

SYSTEMS	
Flexibility and Robustness	The system can meet service needs under a wide range of climate conditions. Assets can be converted or structures modified under stress to introduce new ways to ensure continued functionality.
Redundancy, Modularity and Diversity	There is spare capacity to accommodate unexpected service demand or extreme climate events. System components and pathways provide multiple options or substitutable components for service delivery and are spatially distributed to avoid concentrated failure.
Safe Failure	Failure in one part of the system is unlikely to compromise the ability of the system as a whole to deliver service. The potential for failures to cascade between systems and system components is small.
AGENTS	
Responsiveness and Re-organization	Agents are motivated and able to plan and organize timely action when required, including restructuring. Function, structure and order can be restored in a timely fashion after an extreme event.
Resourcefulness	Agents have access to their own resources or the resources and services of other systems and agents. Priority actions for adaptation can be identified and the necessary resources mobilized for implementation.
Capacity to Learn	Agents are able to identify and anticipate potential risks. Lessons from past failures and external feedback are internalized and improvements implemented.
INSTITUTIONS	
Rights and Entitlements	Access to systems and capacities is assured by equitable rights and entitlements. Collective action is enabled, rather than being constrained.
Decision Making	Decision-making processes are transparent, representative and accountable. Diverse stakeholders have ways to provide input to decisions. Dispute resolution processes are accessible and fair.
Information	Agents have access to necessary information in order to determine effective actions and to make strategic choices for adaptation.

Source: Tyler & Moench (2012)

Goals and Structure

CRiSTAL Food Security is a **decision-support tool for local-level government staff and development practitioners to support the climate resilience of food systems at the community level**. It aims to help users to understand:

- What the key elements of a food system of a given community are and how they are affected by climate variability and change.
- How resilient different parts of the food system are to climate variability and change, and what can be done to improve resilience.
- What indicators can help monitor the evolution of community food system resilience over time.

CRiSTAL Food Security is mainly **targeted at local-level decision-makers**, such as municipal or district-level government staff, project managers of development organizations and local community leaders.

The tool consists of a series of Microsoft Excel spreadsheets and is currently available in **English** and **Spanish**. Its main output is a series of automatically generated reports based on information entered into the spreadsheets.

Figure 3 gives an **overview of the main analytical modules** of CRiSTAL Food Security. The tool is divided into six logically connected modules:

A. The **introduction** consists of three pages on the objectives, approach, concepts and structure of the tool, and of one page for entering information about your application of the tool.

B. The **context** analysis has two pages that look at community characteristics and livelihoods, and at the climate context, respectively.

C. The **food system** analysis looks at the five dimensions described in the conceptual framework above (food utilization and consumption, food access, food availability, supporting resources and services, and supporting organizations and policies). It also considers the sensitivity of key food system elements within each dimension to relevant current and future climate hazards.

D. The **resilience** section uses the same five dimensions and helps the user analyze the resilience of the food system through questions that are specific to each dimension (also see the framework presented above).

E. The **indicators** section guides the user in the identification of specific, measurable, attainable, relevant and time-bound (SMART) resilience indicators based on the analysis in the previous step.

F. The final section automatically produces a series of **reports** that summarize key parts of the analysis.

The five dimensions of the food system framework presented in the concepts section above are reflected throughout the analysis in steps C, D and E.

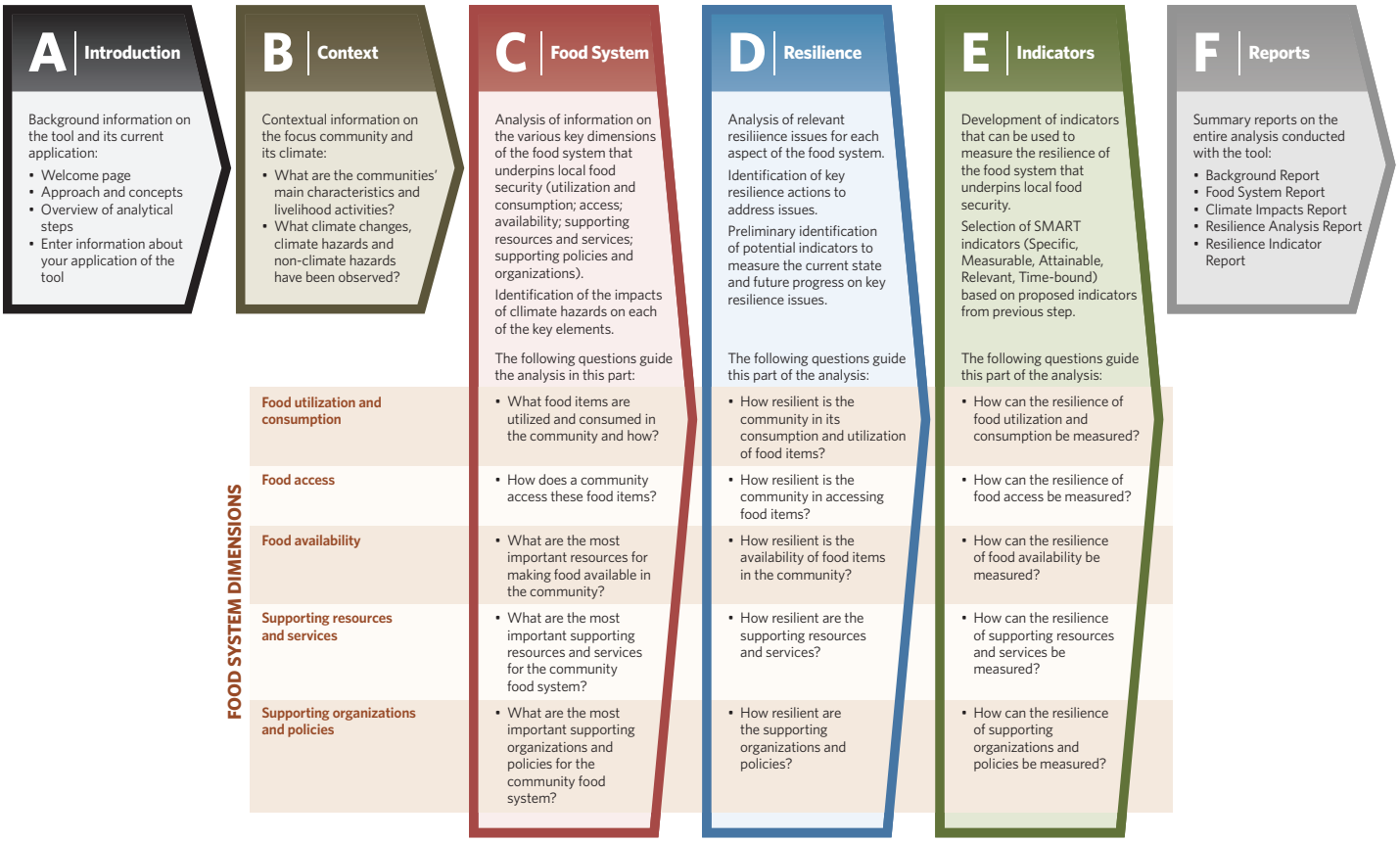
A Introduction
Background information on the tool and its current application:
• Welcome page
• Approach and concepts
• Overview of analytical steps
• Enter information about your application of the tool
B Context
Contextual information on the focus community and its climate:
• What are the communities' main characteristics and livelihood activities?
• What climate changes, climate hazards and non-climate hazards have been observed?
C Food System
Analysis of information on the various key dimensions of the food system that underpins local food security (utilization and consumption; access; availability; supporting resources and services; supporting policies and organizations).
Identification of the impacts of cllimate hazards on each of the key elements.
The following questions guide the analysis in this part:
D Resilience
Analysis of relevant resiliience issues for each aspect of the food system.
Identification of key resilience actions to address issues.
Preliminary identification of potential indicators to measure the current state and future progress on key resilience issues.
The following questions guide this part of the analysis:
E Indicators
Development of indicators that can be used to measure the resilience of the food system that underpins local food security.
Selection of SMART indicators (Specific, Measurable, Attainable, Relevant, Time-bound) based on proposed indicators from previous step.
The following questions guide this part of the analysis:
F Reports
Summary reports on the entire analysis conducted with the tool:
• Background Report
• Food System Report
• Climate Impacts Report
• Resilience Analysis Report
• Resilience Indicator Report
FOOD SYSTEM DIMENSIONS
Food utilization and consumption
• What food items are utilized and consumed in the community and how?
• How resilient is the community in its consumption and utilization of food items?
• How can the resilience of food utilization and consumption be measured?
Food access
• How does a community access these food items?
• How resilient is the community in accessing food items?
• How can the resilience of food access be measured?
Food availability
• What are the most important resources for making food available in the community?
• How resilient is the availability of food items in the community?
• How can the resilience of food availability be measured?
Supporting resources and services
• What are the most important supporting resources and services for the community food system?
• How resilient are the supporting resources and services?
• How can the resilience of supporting resources and services be measured?
Supporting organizations and policies
• What are the most important supporting organizations and policies for the community food system?
• How resilient are the supporting organizations and policies?
• How can the resilience of supporting organizations and policies be measured?

Figure 3: CRiSTAL Food Security Modules

Note that it is possible to apply only parts of the tool. For example, users may only wish to analyze the food system and stop after module C. Similarly, they may wish to stop after module D. The background reports provide a summary of those steps that were completed.

Methods and Resources

The use of the CRiSTAL Food Security tool relies on a combination of primary information gathered through participatory methods (stakeholder consultations, project team discussions) and secondary information gathered through desk-based research. CRiSTAL Food Security provides a framework for organizing, in a simple and logical format, the information collected both at the local level (from communities and key informants) and at higher levels (e.g., scientific information about climate change projections). There is no strict guidance on what information has to come from which source, although consulting the focus communities as much as possible is strongly recommended.

Community Consultations

Almost all analytical steps can be completed by collecting information through community consultations and discussions with other project stakeholders. Although users may have access to some of the required information through their own experience or secondary sources, consultations may yield more detailed and up-to-date information on the community situation, key livelihoods, food system elements and their resilience. Engaging community members in the analysis also ensures that any actions that are planned based on the analysis are accepted by the community and are in line with local needs, priorities and conditions.

The specific methods selected for engaging local stakeholders in applying CRiSTAL Food Security are flexible and left to the discretion of the user, as the choice for appropriate approaches will depend on the cultural context and the experience and capacity of field researchers. Some Participatory Rural Appraisal tools that have been applied in previous CRiSTAL and CRiSTAL Food Security applications in Central America include:

- **Livelihood Strategies**: This technique aims to identify the main income-generating and subsistence activities of different social groups within a community. A series of diagrams are developed to illustrate key productive activities for the main social groups, economic interlinkages, access to important resources and hazards that could affect key activities. This information is critical to understanding food access strategies of the different social groups in a community and the vulnerability of these strategies to climate-related hazards.
- **Resource and Hazard Mapping**: This exercise consists of drawing a map of the community or relevant area and the identification of relevant resources as well as hazards that could affect the resources on the map. In the context of food security and climate resilience, the exercise can be used to map key elements of the food system, such as cropland or food storage facilities, and to understand their exposure to climate hazards. It can also support discussions on resilience, for example by illustrating the spatial diversification of key assets.
- **Vulnerability Matrix**: This tool allows focus groups to identify the most important threats of key climate hazards to their livelihoods and food security by ranking the severity of

Figure 4: Mapping Exercise in a Nicaraguan community

Source: Keller, 2011

Recursos / Amenazas
Falta de agua verano intenso
Mal manejo del medioambiente
Lluvias fuertes
AGUA 3 3 2
ARBOLES 2 3 1
TIERRA 3 3 3
MINERALES ó NUTRIENTES 0/1 2 2
LOS MICRO-ORGANISMOS DEL SUELO 3 3 2
AIRE LIMPIO 1 3 0
SITIOS SAGRADOS 2 0 0
CULTURA 0 3 0
SALUD Y MEDICINA PROPIA 2 3 3
ANIMALES 3 2 2
SEMILLAS 1 0 2
VIAS 1 0 3
COMUNICACIONES 0 0 1
CONOCIMIENTO 0 0 0

Figure 5: Vulnerability Matrix from a Colombian community

Source: Künzler, 2012

the impacts of hazards such droughts or floods on key livelihood resources or food system elements. The ranking exercise can support the prioritization of vulnerable food system elements for the subsequent resilience analysis in the CRiSTAL Food Security tool.

There are many other participatory exercises that can be applied in order to gather information for the different parts of the CRiSTAL Food Security Analysis. Wherever possible, different social groups, such as gender and livelihood groups, should be consulted separately in order to understand the different conditions and challenges they face.

There are numerous guidebooks on participatory rural appraisal tools, many of which have been developed specifically for a sector or a region. The following references are particularly relevant to the context of climate resilience and food security:

- CARE's ***Climate Vulnerability and Capacity Analysis (CVCA) Handbook*** contains facilitation tips and a range of participatory field tools, including hazard mapping, a vulnerability matrix and seasonal calendars with a specific emphasis on climate-related risks. (www.careclimatechange.org/cvca/CARE_CVCAHandbook.pdf)
- The Asian Disaster Preparedness Center's (ADPC) ***Community-Based Disaster Risk Management Field Practitioner's Handbook*** provides a process for community-based disaster risk management with explanations for a range of participatory exercises for each step. (www.adpc.net/pdr-sea/publications/12handbk.pdf)
- The Inter-American Institute for Cooperation on Agriculture's (IICA) ***80 Tools for Participatory Development*** offers a wide selection of participatory tools for rural development appraisal, planning, follow-up and evaluation. (www.iica.int/Esp/regiones/central/cr/Publicaciones%20Oficina%20Costa%20Rica/80tools.pdf)

It is essential that consulted groups have a good understanding of the purpose and expected outcomes of a consultation, in order to ensure meaningful participation and to avoid excessive expectations. Experience shows that it is particularly important to spend enough time explaining key term concepts, such as climate change, resilience, food security and food systems, as they can often be hard to grasp, not only for community members but also for local-level project or government staff.

Other Sources of Information

CRiSTAL Food Security users are encouraged to complement and triangulate the information collected at the community level with additional information collected through desk-based research as well as meetings with researchers, academics, non-governmental organizations and government representatives.

Key information to be collected includes:

- Local livelihood conditions and trends
- Food security issues, especially at larger scales, that can influence the focus community
- Past and current climate conditions and trends, and climate change projections
- Other relevant environmental and socioeconomic trends affecting the focus community

Required Resources

The resources required to apply the CRiSTAL Food Security tool can vary according to the objectives and capacities of users, the availability of background information and the willingness of key stakeholders to participate in the analytical process:

- **Knowledge and skills**: Researchers involved in the application of CRiSTAL Food Security should have basic knowledge of climate variability and change, resilience, livelihoods, food security, and gender and diversity. They should be able to use a range of participatory rural appraisal tools and have good facilitation skills. Basic computer literacy is required to use the Excel-based tool itself. A comprehensive training may be required for the researchers involved before they begin the analysis.
- **Participants**: There should be at least two facilitators (one moderator and one note taker). The facilitation team should include both men and women. To cover the required knowledge and skills noted above, it may be best to assemble interdisciplinary facilitation teams. Consulted groups should ideally consist of about 10, but not more than 15 community members.

- **Time**: Typically, users will need two or three full-day visits to a community in order to cover the entire analysis. The visits do not need to happen consecutively and a few days or weeks might be needed in between to input and process collected information appropriately. Discussions with different focus groups within a community can ideally take place in parallel. One or two days are necessary for background research, and another one or two days are required to enter and process the research results with the CRiSTAL Food Security tool.
- **Material**: Usual materials needed for participatory exercises include flipcharts, markers, coloured paper, masking tape, notebooks, etc. Having a camera is useful. Snacks and drinks should be provided to participants. For the analysis as such, a computer equipped with Microsoft Excel and a printer to distribute the summary reports are needed.
- **Cost**: Cost can vary considerably as a function of specific human (e.g., training, staff time) and physical resources (e.g., use of meeting rooms, material, food) in the process.

Users of CRiSTAL Food Security should remain open to adapting the research process constantly in response to specific local conditions and needs. For example, it may in some cases become necessary to spend more time explaining certain concepts before moving on to the next analytical step.

CRiSTAL Food Security Step-by-Step

This section provides a brief description of each step of the CRiSTAL Food Security analysis. It does not provide details on how to gather the necessary information, but explains the purpose and details of each analytical step.

Getting Ready

Before you start your CRiSTAL Food Security Analysis, make sure to read through the first part of this manual and ensure that you have access to the required resources for conducting a thorough assessment. Then download the tool from the CRiSTAL website (www.iisd.org/cristaltool) and open the tool in Microsoft Excel. You are now ready to enter information into the spreadsheets.

Navigation in CRiSTAL Food Security is easy. There is a tab for each analytical step described below (see Figure 6). There are explanations on the purpose and content on each tab. In addition to the general explanations that are always visible, additional guidance is available for cells that are marked with a red triangle in the top right corner.

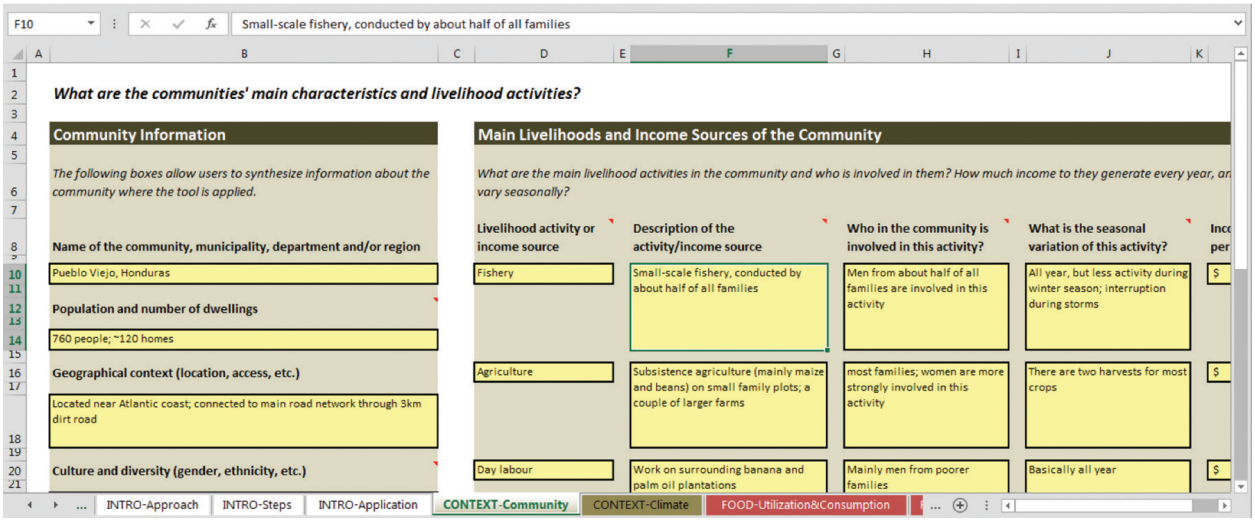
F10
Small-scale fishery, conducted by about half of all families
What are the communities' main characteristics and livelihood activities?
Community Information
The following boxes allow users to synthesize information about the community where the tool is applied.
Name of the community, municipality, department and/or region
Pueblo Viejo, Honduras
Population and number of dwellings
760 people; ~120 homes
Geographical context (location, access, etc.)
Located near Atlantic coast; connected to main road network through 3km dirt road
Culture and diversity (gender, ethnicity, etc.)
Main Livelihoods and Income Sources of the Community
What are the main livelihood activities in the community and who is involved in them? How much income to they generate every year, ar
vary seasonally?
Livelihood activity or income source
Description of the activity/income source
Who in the community is involved in this activity?
What is the seasonal variation of this activity?
Fishery
Small-scale fishery, conducted by about half of all families
Men from about half of all families are involved in this activity
All year, but less activity during winter season; interruption during storms
Agriculture
Subsistence agriculture (mainly maize and beans) on small family plots; a couple of larger farms
most families; women are more strongly involved in this activity
There are two harvests for most crops
Day labour
Work on surrounding banana and palm oil plantations
Mainly men from poorer families
Basically all year
INTRO-Approach
INTRO-Steps
INTRO-Application
CONTEXT-Community
CONTEXT-Climate
FOOD-Utilization&Consumption

Figure 6: Snapshot of CRiSTAL Food Security Interface

The information entered on each page is automatically linked to cells on other pages. Make sure to keep your spreadsheets protected to avoid deleting Excel formulas that link cells between different tabs. If you need to revise, update or change previously entered information, simply go back to the respective tab—CRiSTAL Food Security is flexible and allows for an iterative analytical process.

A) Introduction

The introductory part of the tool consists of three tabs outlining the aims and target audience of the tool, the approach and key concepts, and the analytical structure. The fourth tab belonging to the introductory module allows users to fill in data on their application of the tool, such as:

- The **name, organization, position** and **contact data** of the person who is leading the analytical process.
- The **date** on or **time period** during which the tool was applied.
- **Information sources** and **research methods** used.

Entering this information makes it possible to understand when and how the analysis was conducted and allows interested stakeholders to contact the lead person after the analysis is completed.

B) Context

There are two tabs summarizing important contextual information that will be used in subsequent analytical steps. The first tab looks at the community and livelihood context, whereas the second tab summarizes information on past, current and future climate conditions and hazards.

Community Context

In the left-hand section of this step, you can enter **background information on the community** where the tool is being applied. This covers the following aspects:

- **Name of the community, municipality, department and/or region**
- **Population** size and **number of dwellings**
- **Geographical context** (e.g., location, access, etc.)
- **Culture and diversity**: Observations or secondary information on gender, diversity and cultural practices (e.g., differences in livelihood activities between men and women, religious practices, etc.)
- **Governance**: Formal and informal governance mechanisms (e.g., local governments, water management council, justice schemes, etc.)
- **Education and skills**: Formal and informal education (e.g., average number of school years) and skills (vocational skills, organizational capacity, etc.) among the local population

In the right-hand section, you can enter details on up to four **livelihood activities**. For each activity, you can enter:

- The **name of the activity or income source** (for example, agriculture, fishery, tourism, etc.)
- **Description** of the activity (e.g., types of crops for agriculture; small- or large-scale for fisheries; etc.)
- **People who are involved in the activity**: How many people are involved in the activity, and from what social groups (e.g., 30 per cent of the inhabitants, the poor, men only, mostly women, etc.)
- **Seasonal variation of the activity**: How the intensity of this activity varies throughout the year (e.g., day labour only takes place during harvesting season in May and June; remittances are stable through the year, etc.)
- The average **income generated per year from this activity:** How much income the activity generates per year for the entire community on average (when in doubt, use the average of the previous five years). If this topic is sensitive, you can put percentage points into these boxes or leave them empty. Note that the total income for the community is automatically calculated at the bottom of the table, unless you have not filled out these boxes.

Climate Context

This tab allows users to summarize information about the current climate, observed and projected climate change, and on the main climatic and non-climatic hazards affecting the community.

The left-hand section looks at current climate conditions, as well as observed and projected climate change:

- The first two boxes allow users to enter information about **current climate conditions**: one is for scientific information (e.g., from the national meteorological department) and the other one is for community observations (e.g., how community members describe their own climate). The juxtaposition of the two boxes allows for comparison of different perspectives on the same question.
- The next two boxes look at **observed (i.e., past) climate change**. Typically this will involve any permanent changes in average climate variables (e.g., mean temperature, annual rainfall, the number of extreme events) over the past decades. Again, scientific information and community observations are compared. Community observations tend to be shorter term and more local, while scientific records can reach further back, but might be only available at larger scales.
- The final four boxes allow users to enter information on **projected climate change**. As these are not observed variables, but scientific projections, there is no box for community observations here. There are separate boxes for projections on changes in temperatures, rainfall, frequency and intensity of extreme events, and other phenomena (e.g., sea-level rise).

Box 2: Finding and Using Climate Change Information

Scientific information on observed and projected climate change trends and impacts at national and regional levels can be accessed through the following sources:

- **Intergovernmental Panel on Climate Change reports**: These summarize the current knowledge on climate change and its impacts by region and for ecological zones. (http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html)
- **United Nations Framework Convention on Climate Change (UNFCCC) National Communications**: These documents are prepared by signatory Parties to the UNFCCC, and communicate the results of national assessments of greenhouse gas emissions, as well as information on vulnerability, impacts and adaptation. Observed and anticipated trends and impacts of climate change for users' countries can be drawn from these documents. (http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php and http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/4903.php)
- **The World Bank Climate Change Knowledge Portal**: This platform provides an online tool for access to comprehensive global, regional and country data related to historical, current and future climate impact and vulnerability. (http://sdwebx.worldbank.org/climateportal/index.cfm)
- **Climate Wizard** provides climate change information and visualizes the impacts anywhere on Earth (www.climatewizard.org)
- **The Adaptation Learning Mechanism** provides country summaries on observed and projected climate change and impacts. (www.adaptationlearning.net)

There are many other relevant sources of information, often region- or country-specific, which we cannot list here. Make sure to search the Internet thoroughly and consult local experts.

Climate change projections should be used carefully because they are based on imperfect climate models and on development scenarios that are inherently uncertain. We therefore recommend that you compare different sources and look for projections that are based on different models and scenarios. Also, make sure to note any uncertainty ranges that are mentioned in the projections (e.g., a projected 3°C temperature rise by 2050 may come with an uncertainty range of 1.5°C to 5°C; average rainfall projections may be negative but the uncertainty range can be from +20 to -50 per cent; extreme events projections are often even more uncertain).

The right-hand section of the tab looks at key current and future climate hazards. Climate hazards are "potentially damaging hydro-meteorological events or phenomena; they can be events that have an identifiable onset and termination, such as a storm, flood or drought, as well as more permanent changes, such as shift from one climatic state to another" (Lim & Spanger-Siegfried, 2005).

Select up to four climate hazards not only based on community consultations, but also taking into account scientific information entered on the left-hand side, as communities may not know what future hazards can potentially affect them. For each climate hazard selected, you will then be asked to specify:

- Whether it is a **current** or potential **future** hazard
- Its **frequency**: how often a hazard occurs (e.g., once every year, twice a decade)
- Its **intensity**: how "strong" the hazard is when it occurs (e.g., moderate drought lasting two to three weeks)
- Its **future evolution under climate change**: anticipated changes in the location, duration, frequency and intensity of the hazard under climate change (e.g., storms are likely to occur less often but to become more intense in a specific area).

There is also a space to briefly describe any non-climate hazards mentioned by the focus group (e.g., earthquakes, volcanoes, diseases). These will not be taken forward in the analysis but are important to be kept in mind because it can help you understand the broader vulnerability context.

C) Food System

The food system analysis follows the conceptual framework presented above. There is one tab for each ring of the spinwheel presented on page 6: food utilization and consumption, food access, food availability, supporting resources and services, and supporting organizations and policies. Each tab has two parts: the left-hand side describes key elements of the respective food system component and the right-hand side looks at how the climate hazards defined in the previous step affect the food system elements.

Food Utilization and Consumption

This step looks at the main food items that are consumed in the community and potential food utilization issues relating to health, access to water and sanitation, as well as cultural issues:

- Up to **10 main food items** consumed in the community should be listed in the top left part of the tab. You should then define the importance of each food item on a scale from 1 (not very important) to 3 (very important). Importance can be subjective (as felt by community members) and can relate to nutritional, cultural or other aspects. In the "observations" box you can note reasons for considering items important, whether there is seasonal variation in consumption of each item, whether there are differences in consumption patterns between social groups (especially genders) and other observations.
- Move down to the **health and water** section. There are two boxes for noting health issues and observations on the state of access to clean water and sanitation in the community. Both aspects are critical for food utilization, as poor health and lack of access to clean water and hygiene can undermine the ability of community members to digest and thus utilize food.
- At the bottom of the tab you will find the **diversity and culture** section. Here you can note any observations on different consumption patterns between genders and social groups as well as on the cultural preferences of certain food types over others.

Having completed the left-hand side, you can look at how the up to four **climate hazards** entered in the previous tab **affect** the consumption of food items, health issues and access to water and sanitation, and how they may affect the differences in consumption patterns between genders and social groups. For each food item and utilization issue there is a box to describe the most important impacts and one for ranking its sensitivity on a scale from 0 (not sensitive) to 3 (very sensitive).

Food Access

This tab looks at how the up to 10 food items listed in the previous step are accessed by the community through different access strategies, such as subsistence or purchase. The list of food items is automatically copied from the previous tab. Proceed with the analysis as follows:

- Select relevant **food access strategies**: Five possible food access strategies are proposed (subsistence, local purchase, external purchase, barter and food aid). You can replace the last two with other strategies if required.
- For each food item, choose the **most important food access strategy** by marking "yes" in the respective box. If more than one is very important (e.g., a food item is accessed through two or three strategies to a similar extent; one access strategy is less important overall but critical in a specific period), you can mark more than one strategy with a "yes." You can leave other boxes blank.
- In the boxes to the right, you can describe **seasonal variations** in food access strategy. Refer to a normal year representing average climate conditions described in the climate context section and without severe climatic events.

At the bottom of the page there is a section that looks at **income use**. The total annual income is copied from the community context tab. You are asked what share of this income is normally used to purchase food, and whether this share varies significantly between households in the community. If some households use a significantly higher

share of their income for food purchase, note which households are concerned and approximately what income share they use for food.

Having completed the left-hand side, you can look at how the up to four **climate hazards** entered in the climate context tab **affect** food access. For each food item there is a box to describe the most important impacts and one for ranking its sensitivity on a scale from 0 (not sensitive) to 3 (very sensitive).

Food Availability

In this step, key resources that are needed for making food available to the community are identified. As a reminder, identified food items and access strategies from the previous tab are displayed on the left-hand side. Proceed as follows:

- In the first column of boxes, identify up to **five important resources or services that relate to food availability** issues such as food production, processing and packaging, distribution and retail, preparation and storage, and markets.
- Note who in the community has **access** to (i.e., is able to benefit from) these resources and services.
- Identify who **controls** access to each resource or service (i.e. who, within or outside the community, has the ability to mediate other people's access to each resource?)
- Note any **trends in the state of the resource or service** (i.e., is the resource or service in a good or bad state? Is it degrading, expanding, improving, etc.?).

The right-hand side of the tab looks at climate impacts. The four climate hazards identified in the climate context tab are shown in the top row. Rank the impact of each hazard on each resource according to the following scale:

- 2= high positive impact
- 1= medium positive impact
- 0= no impact
- -1= medium negative impact
- -2= high negative impact

Then describe important impacts in the box on the right.

Supporting Resources and Services

This tab looks at the natural, physical and financial supporting resources and services that are needed to make the core food system described in the three previous steps work. As a reminder, key food availability resources entered in the previous tab are shown on the left hand side. Conduct the following steps:

- Identify up to three natural and three physical **supporting resources and services** in the first column of boxes. Examples of natural resources include land, soil and forests. Water is set as a default resource. Physical resources refer to elements such as communication and energy infrastructure. Roads are set by default. Default resources can be removed if not applicable.
- Next, note who in the community has **access** to (i.e., is able to benefit from) these natural and physical resources and services.
- Then, identify who **controls** access to each resource or service (i.e. who, within or outside the community, has the ability to mediate other people's access to natural and physical resources?).
- Note any **trends in the state of the resource or service** (i.e., is the resource or service in a good or bad state? Is it degrading, expanding, improving, etc.?).

You will note that the income sources identified in the community context tab are automatically copied and presented as financial resources below. Note any relevant trends for each income source.

The right-hand side of the tab looks at climate impacts. The four climate hazards identified in the climate context tab are shown in the top row. Rank the impact of each hazard on each resource according to the following scale:

- 2= high positive impact
- 1= medium positive impact
- 0= no impact
- -1= medium negative impact
- -2= high negative impact

Then describe important impacts in the box on the right.

Supporting Organizations and Policies

As a final step of the food system analysis, this tab looks at the organizations and policies that support the entire food system. At the community level, these can be local organizations that support the management of natural resources (e.g., water committees) or provide emergency response services. It also entails political resources, such as important power relations and access to the decision-making process (e.g., good relations to a regional governor). Cultural resources are also included here. You are asked to conduct the following analytical steps:

- Identify up to three **social resources** (e.g., community organizations, networks, relationships of trust, reciprocity and exchanges), up to two **political resources** (e.g., access to the decision-making process, power relations) and up to two **cultural resources** (e.g., rituals, religious beliefs, taboos).
- Note who in the community has **access** to (i.e., is able to benefit from) these social, political and cultural resources and services.
- Identify who **controls** access to each resource or service (i.e., who, within or outside the community, has the ability to mediate other people's access to social, political and cultural resources?)
- Note any **trends in the state of the resource or service** (i.e., is the resource or service in a good or bad state? Is it degrading, expanding, improving, etc.?).

The right-hand side of the tab looks at climate impacts. The four climate hazards identified in the climate context tab are shown in the top row. Rank the impact of each hazard on each resource according to the following scale:

- 2= high positive impact
- 1= medium positive impact
- 0= no impact
- -1= medium negative impact
- -2= high negative impact

Then describe important impacts in the box on the right.

With this step, you have completed the food system analysis.

D) Resilience Analysis

The resilience analysis takes you through the same five components of the food system (utilization and consumption, access, availability, supporting resources and services, supporting organizations and policies). There is one tab for each component. In each tab, a summary of the analysis conducted for the respective food system component is presented on the left-hand side. On the right-hand side of each tab, you will find between three and five resilience questions. You are then encouraged to conduct the following tasks:

- Provide a detailed **answer to each resilience question**, taking into account the summary of the previous analysis located on the left as well as your general knowledge of the community.
- Propose **resilience actions** that address the specific resilience issues identified in the answer to the resilience questions.

- Identify a range of SMART (specific, measurable, attainable, relevant, time-bound) **potential indicators**. Examples for possible indicators are provided for each resilience question. There is no need to select a specific indicator here—this will be the remit of the next section of the tool. The idea is to provide a list of potential indicators that can then be refined in the next section.

In each tab, there is also an optional box for additional remarks on the resilience of the respective food system component. This may include observations that do not fit into the answers to the specific resilience questions. For example, you may identify fundamental barriers to resilience that go beyond the scope of the resilience questions, such as lack of land tenure or water scarcity.

Resilience of Food Utilization and Consumption

The specific resilience questions that have to be answered in the context of food utilization and consumption are:

- Do households in the community consume diverse nutritional sources throughout the year?
- Is there equitable access to food within households?
- Are there health and sanitation issues in the community that could affect the nutrition of individuals?
- What types of storage and cooking techniques are available to households?

More detailed explanations on the background of each resilience question are available in the tool (place the cursor over the cell in which the questions is stated).

Resilience of Food Access

The specific resilience questions that have to be answered in the context of food access are:

- Do the households in the community have diverse ways to access food throughout the year?
- Is food access in the community equitable between households?
- What share of household incomes used to purchase food?

More detailed explanations on the background of each resilience question are available in the tool (place the cursor over the cell in which the questions is stated).

Resilience of Food Availability

The specific resilience questions that have to be answered in the context of food availability are:

- Are the key resources for food availability (such as storage systems) spatially distributed, so that they are not easily disrupted by climate hazards?
- Do key resources for food availability have multiple options for service delivery?
- Do key resources for food availability have sufficient capacity and alternative options for service delivery, and are they accessible for all?
- Are mechanisms in place to counter hoarding behaviours?

More detailed explanations on the background of each resilience question are available in the tool (place the cursor over the cell in which the questions is stated).

Resilience of Supporting Resources and Services

Before turning to the specific resilience questions, a pre-selection of three supporting resources and services is proposed here, as the analysis would be too complex if the resilience questions had to be answered for each resource. The resources should be pre-selected based on their climate sensitivity or due to their importance in responding to negative climate impacts. There are boxes for noting the three prioritized resources or services and for providing a justification of this selection. The following resilience questions are then answered for each of the three priority resources:

- Is the resource in good condition?
- Is the resource/service spatially distributed so that it is not completely disrupted by a single climate hazard?
- Does the resource/service have substitutable components or multiple options for delivering its service?
- Does the resource/service have spare capacity?
- Is there potential for cascading failures in linked infrastructure services if one element fails?

More detailed explanations on the background of each resilience question are available in the tool (place the cursor over the cell in which the questions is stated).

In contrast to the resilience analysis of the four other components, resilience actions and indicators are identified here by resource. Consider your answers to all the resilience questions when identifying appropriate resilience actions.

Resilience of Supporting Organizations and Policies

The specific resilience questions that have to be answered in the context of supporting organizations and policies are:

- Can key community organizations and governmental institutions restore their functionality after a climate-related shock or stress?
- Do the supporting organizations and policies provide equitable access within the community?
- Do community organizations have the capability to establish priorities, implement plans and mobilize resources permanently?
- Is there a capability to learn and avoid repeated failures and to innovate to improve performance?
- Are community organizations and key government institutions sufficiently decentralized to be responsive to citizens' needs?

More detailed explanations on the background of each resilience question are available in the tool (place the cursor over the cell in which the questions is stated).

E) Indicator Selection

In this section, SMART (specific, measurable, attainable, relevant and time-bound) resilience indicators are selected and defined. There is one tab for each component of the food system. Each tab has the same structure, showing first the resilience questions, responses, actions and potential indicators as identified in the resilience analysis section. In each tab, you are encouraged to conduct the following steps:

- **Select resilience indicators**: Select the most important indicators based on the potential indicators developed in the previous section. You can choose up to three per resilience question, but often you may select none or only one or two. In this case, leave unused boxes blank.
- **Define the indicators**: Explain the indicator measures specifically (e.g., percentage of households in community with a fridge, share of irrigated crop land)
- Identify **data sources and responsible organizations**: Explain what data sources should be used to measure the indicator over time and what organization is providing the information.
- Identify a **person** who will be responsible for collecting information on each indicator.
- Provide the current **value of the indicator** (baseline).
- Provide a **target value** along with a target time horizon.

You may want to conduct this indicator selection exercise iteratively, as you may find out that some proposed indicators cannot be operationalized due to lack of data or other reasons, or that additional indicators are needed for specific aspects. Be aware of the importance of strictly prioritizing indicators. The analysis allows you to identify many indicators, but for a practical monitoring system it may make sense to measure no more than 20 indicators across time. You may consider integrating the indicators into existing monitoring systems (such as community indicators on food security that are monitored as part of food security early warning systems).

F) Reports

CRiSTAL Food Security automatically produces five summary reports:

- A **background report** summarizing technical data on the current application of the tool as well as background information on CRiSTAL Food Security.
- A **food systems report** summarizing information entered into the CRiSTAL Food Security tool on the different layers of the food system of the assessed community.
- A **climate impacts report** summarizing information entered into the CRiSTAL Food Security tool on the impacts of climate variability and change on the different parts of the community food system.
- A **resilience analysis report** summarizing the resilience analysis of the different components of the food system of the assessed community.
- A **resilience indicators report** summarizing details of the selected resilience indicators.

The reports are programmed in a printer-friendly format. They allow you to use the results for further work and to share them with other people.

Additional Resources

A range of resources is available on the **CRiSTAL website** (www.iisd.org/cristaltool) and on the **website of the Climate Resilience and Food Security in Central America (CREFSCA) project** (www.iisd.org/adaptation/crefsca). Among other things, you can find:

- Downloads of CRISTAL Food Security tool and user's manual and of other versions of the CRiSTAL tool.
- The paper, *Climate Resilience and Food Security: A Framework for Planning and Monitoring*, which lays out the conceptual basis for this tool.
- Examples of past CRiSTAL and CRiSTAL Food Security applications around the world, including a database of users' reports.
- An events calendar showing upcoming training sessions and other activities.

From time to time, **training workshops** on CRiSTAL and on CRiSTAL Food Security are conducted in different regions around the world. Previous experiences with using CRiSTAL have demonstrated that, for new users, it is important to attend a training session. The training workshops often provide participants with an introduction to some of the basic concepts and approaches to climate change, its links to sustainable livelihoods and food security, and how they relate to the CRiSTAL process. Group work and practical application are strongly emphasized. However, each training session is different, tailored to the expressed needs and available resources of the community. Examples of completed training sessions are available through the CRiSTAL website.

Please check the website regularly for updates about the tool and its applications (e.g., translation of the tools into different languages, development of online training materials).

To **learn more** about CRiSTAL Food Security and associated training opportunities, or simply to share your experience with the CRiSTAL application, please contact: Alicia Natalia Zamudio (anzamudiotrigo@iisd.org) or Anne Hammill (ahammill@iisd.org) at the International Institute for Sustainable Development (IISD).

References

Intergovernmental Panel on Climate Change. (2012). Summary for policymakers. In C.B. Field et al. (eds.), *Managing the risks of extreme events and disasters to advance climate change adaptation: A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change* (pp. 1–19). Cambridge, U.K.: Cambridge University Press.

Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: Contributions of a resilience framework. *Annual Review of Environmental Resources, 32,* 395–419.

Schmidhuber, J. & Tubiello, F. (2007). Global food security under climate change. *Proceedings of the National Academy of Sciences of the Unites States of America, 104*(50), 19703–19708. Retrieved from http://www.pnas.org/content/104/50/19703.full.pdf

Tyler, S. & Moench, M. (2012). A framework for urban climate resilience. *Climate and Development, 4*(4), 311–326.

Tyler, S., Keller, M., Swanson, D., Bizikova, L., Hammill, A., Zamudio, A.N., et al. (2013). *Climate resilience and food security: A framework for planning and monitoring.* Winnipeg: International Institute for Sustainable Development.

Lim, B. & Spanger-Siegfried, E. (Eds.). (2005*). Adaptation policy frameworks for climate change: Developing strategies, policies and measures.* United Nations Development Programme. Retrieved from http://www.preventionweb.net/files/7995_APF.pdf

United Nations International Strategy for Disaster Reduction. (2009, May). *2009 UNISDR terminology on disaster risk reduction.* Geneva: United Nations.

World Food Summit. (1996). Rome Declaration on World Food Security. Rome: FAO. Retrieved from http://www.fao.org/docrep/003/w3613e/w3613e00.HTM

Photo: Local consultation in the community of California, Honduras.

CRISTAL
food security

For more information, please consult www.cristaltool.org